

HOW TO...

Get answers in Excel

You know the answer, but what's the question? Excel's Goal Seek can help you predict the conditions for the outcome you want, as Rod Lawton explains

Creating a spreadsheet can start off well enough, but after a while you realise you already know the outcome you want, and it's how you get to it that's defeating you.

Normally, a spreadsheet is engineered forwards. That is, you start with the input data, enter the formulae and functions and then find out what the outcome is. It might be your household budget or it might be your department's sales forecasts. It is then possible to play around with 'what ifs'. But what if you already know the outcome? You might know you've got to make your outgoings match your income, or your boss may have told you next quarter's sales have got to be up 25 per cent. It would be unfeasible to keep tapping in different input values using trial and error until you get close enough. Fortunately, you can get the Goal Seek tool to do it for you.

You may be thinking Goal Seek uses super-complex maths to carry out calculations beyond the capacity of the human brain. Actually it just does what you would do, only many times per second. It makes a guess, sees what the answer is, revises its guess and tries again. We've used Excel 2003 here, but we've also made sure it works in earlier versions back to Excel 2000.

1 For our example, we've created a mythical company called High-gear Chainwheels. If you want to follow this tutorial exactly as shown here, download the Goal Seek Example spreadsheet from the cover disc. Our job is to work out whether we can afford to make custom sports chainwheels for a trade price of £1.25 each. If our production processes are simple and

we're simply quoted a fixed cost per 1,000 chainwheels, we can see straight away from our worksheet whether or not we'll make a profit. We can sell 1,000 chainwheels for £1,250 and they're costing us only £987, so we're in the clear. It's easy to reverse-calculate the production cost, too; clearly, it needs to come in at under £1,250 per 1,000.

2 Production costs are rarely that straightforward, though. Usually, there's a setup or tooling cost to factor in. Let's say our supplier is quoting us a £1,600 setup/tooling cost in addition to the per-thousand cost. Enter Setup Cost in cell A6 and £1,600 in cell B6. We need to add a new formula to our Total cost in cell B9 to take this into account. Change the formula in cell B9 to $=B8/1000*B7+B6$. This is the production run divided by 1,000 times the cost per 1,000 plus the initial setup cost. Now, though, we can see the unit cost for a batch of 1,000 chainwheels (in cell B10) is higher than the trade price we can get for them (in cell B12).

3 Situations such as these are common, where a fixed setup cost will eventually be offset when you sell enough of the items. But how do you work out the break-even point? Suddenly, the calculation has got a lot more complicated. It is possible to solve it with algebra, but we're going to use the Goal Seek tool. Click on

the Unit cost, cell B10 (this is our Goal) and choose Goal Seek from the Tools menu.

4 It's not always easy to remember which cells go in which box. Here, the Set cell: box is the cell we want to be a specific value. This is cell B10, our Unit cost. Excel will fill in that box for you. The To value: is the value we're trying to get to, so enter £1.25 in this box. The third box, By changing cell:, contains the cell whose value we're guessing (in this case, that's the Production run cell, or B8). Make sure the cursor is in this box (you can click in it or use the Tab key) and then click on cell B8.

5 Press the OK button, and a few moments later Excel comes up with the answer. In our example, Goal Seek shows us that we need a production run of 6,067 to break even. There will be some instances where a correct solution is impossible (Goal Seek isn't smart enough to spot these in advance) or when an exact answer appears almost straight away. The Goal Seek tool will give up after 100 iterations, or when the answer is within 0.001 of the target value.

6 The Goal Seek tool is a process, not a formula. If you change any of the input values, such as the setup cost or the cost per thousand, Goal Seek will have to be run again. Let's say our supplier offers a revised per-1,000 quote of £960. We simply repeat the process in Step 4 to get the new break-even production run. 

DID YOU KNOW?

Goal Seek works by changing any single input value to achieve the desired target. Our example could have had a fixed value for the production run, using Goal Seek to find what the setup cost would be to achieve that.

	A	B
1	HIGH-GEAR CHAI	
2		
3	Production costs	
4	Custom sports chainwheels	
5		
6		
7	Per 1000 chainwheels	£ 987.00
8	Production run	1000
9	Total cost	£ 987.00
10	Unit cost	£ 0.99
11		
12	Trade price	£ 1.25

	A	B
5		
6	Setup cost	£1,600.00
7	Per 1000 chainwheels	£ 987.00
8	Production run	1000
9	Total cost	$=B8/1000*B7+B6$
10	Unit cost	£ 2.59
11		
12	Trade price	£ 1.25
13		
14		

	A	B	C
1	HIGH-GEAR CHAI		
2			
3	Production costs		
4	Custom sports chainwheels		
5			
6	Setup cost	£ 1,600.00	
7	Per 1000 chainwheels	£ 987.00	
8	Production run	1000	
9	Total cost	£ 2,587.00	
10	Unit cost	£ 2.59	

	A	B
5		
6	Set cell: B10	£1,600.00
7	To value: £1.25	987.00
8	By changing cell: B8	1000
9	Total cost	£ 2,587.00
10	Unit cost	£ 2.59
11		
12	Trade price	£ 1.25
13		
14		

	A	B
5		
6	Setup cost	£1,600.00
7	Per 1000 chainwheels	£ 987.00
8	Production run	6067
9	Total cost	£ 7,588.21
10	Unit cost	£ 1.25
11		
12	Trade price	£ 1.25
13		
14		
15		
16		
17		

	A	B	C
4	Custom sports chainwheels		
5			
6	Setup cost	£ 1,600.00	
7	Per 1000 chainwheels	£ 960.00	
8	Production run	5522	
9	Total cost	£ 6,900.70	
10	Unit cost	£ 1.25	
11			
12	Trade price	£ 1.25	
13			
14			